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Memorandum

To: ARD-Refuges and Wildlife (60130)
From: Acting Regional Engineer, Region 6
Subject: 1988-1989 Annual Water Use Report/Management Plan

The subject report for Lake Andes National Wildlife Refuge Complex has been reviewed and approved as submitted. Please convey our thanks to Refuge personnel.

/S/ CHERYL C. WILLISS

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1989 ANNUAL WATER MANAGEMENT PLAN
AND
1988 WATER CONDITIONS AND USAGE

MP 5/3/89

LAKE ANDES NATIONAL WILDLIFE REFUGE COMPLEX
LAKE ANDES, SD

WATER UNIT: Lake Andes

I. Introduction

Lake Andes is a 4730 acre meandered lake whose water level depends entirely upon annual runoff. Two dikes cut the lake into three units, the North, Center, and South. Stop log water control structures are located within each dike; however, the lack of a permanent water supply precludes any water level manipulations.

Drainage area size and surface acres for each unit of Lake Andes are shown below. Maximum and average depth figures were determined in 1962.

Unit	Drainage Area Acres		Surface Acres of Water	Water Capacity (Acre Feet)	Depth/full	
					Max	Avg
South	20,000	24%	1,760	16,159	13.5	11.5
Center	11,000	14%	2,359	18,000	14.5	12.9
North	53,000	62%	611	3,015	10.5	9.1
TOTAL	84,000	100%	4,730	37,174	--	--

In 1922, Congress passed a bill establishing a high water elevation of 1437.25 feet msl for Lake Andes via the construction of an artificial outlet on the South Unit. This level was established following local complaints about flooding around the lake. The Fish and Wildlife Service received the right to flood the meandered lake bed of Lake Andes in an easement taken in 1939 from the State of South Dakota.

II. 1988 Water Conditions

In 1986 Lake Andes filled for the first time since 1962 and remained at or above full pool elevation until the end of August, 1987. Water elevation at freeze up in 1987 was 1436.00 feet msl.

Ice out on Lake Andes occurred on 03/22/88 with spring runoff bringing the pool elevation to 1437.37 on 03/31.

Little precipitation was received during 1988 and the Lake dropped gradually to an elevation of 1435.58 at freeze-up on 11/27.

Date	1988 Lake Andes Water Levels - Feet MSL		
	North Unit	Center Unit	South Unit
03/22	Ice Out		
03/31	1437.37	1437.37	1437.37
05/10	1437.29	1437.29	1437.29
06/08	1437.22	1437.22	1437.22
07/01	1436.75	1436.75	1436.75
08/01	1436.33	1436.33	1436.33
08/31	1435.93	1435.93	1435.93
10/03	1435.80	1435.80	1435.80
11/04	1435.58	1435.58	1435.58
11/27	Freeze Up		

III. Ecological Effects of Increased Water Levels In Lake Andes

In 1988, Lake Andes habitat conditions remained very similar to those of 1987. The rapid increase in water levels in 1986 drowned out approximately 95% of the cattail stands and eliminated much of the production of submergent vegetation. In 1988 submergent species recovered quite well, but production was far below average because of the deep water conditions.

Waterfowl breeding pairs totaled 713, down by 10% from 1987. This compares to a peak of 1326 pairs in 1983 when Lake Andes began to fill after a period of drought. The deep, open water habitat with few emergents provided less than ideal pair and brood habitat. This "big lake" situation delayed freeze up and provided late migration habitat for mallards and snow geese.

Large numbers of colonial tree-nesting birds such as black-crowned night herons, snowy egrets, cattle egrets and great blue herons nested in flooded Russian olive trees in Owens Bay.

The high water conditions continued to benefit the Lake Andes sport fishery. Excellent populations of largemouth bass, yellow perch and bluegill exist in all units. In 1987, a contract was issued to a private fisherman to commercially fish bullheads. It had been determined by fishery biologists that recruitment of game fish species was limited by the high bullhead populations.

The potential for a fish winter kill, generally a problem on Lake Andes, has been reduced significantly by the deep lake conditions, but if runoff is not received in 1989, a winterkill is a definite possibility.

IV. 1989 Water Management Objectives

Management objectives for 1989 are to contain as much runoff as possible in Lake Andes. Water in excess of the 1437.25 elevation mandated by Congress will continue to be released from the outlet on the South Unit.

WATER UNIT: Owens Bay

I. Introduction

The Owens Bay Unit is a 240 acre marsh unit, separated by a dike from the South Unit of Lake Andes. A stop-log water control structure is located in the dike to allow water releases into Lake Andes.

Owens Bay, in addition to water from natural runoff, is maintained by a free flowing artesian well. The well, drilled in 1957, originally had a 1000 gpm flow and water right. Well shutdowns during the 1973 DVE outbreak resulted in casing destruction and new casing had to be installed. The new casing reduced the well opening from 12" to 8" and dropped the flow to approximately 450 gpm.

In 1986, Ducks Unlimited funded the drilling of a new 12" artesian well and the old well was capped. The new well has a 800-1000 gpm flow. The well distribution box and pipeline supplying the Prairie Ponds were also replaced. In 1987 the four water control structures on the prairie ponds were retrofitted with new screw gates for better water control.

II. Objectives

Owens Bay water management objectives are to store annual runoff and artesian well water to be used primarily as waterfowl habitat. Waterfowl production is the primary objective on Owens Bay. The emphasis is on providing excellent breeding pair habitat and permanent brood water. Secondary objectives include providing waterfowl migrational habitat and benefits for marsh and water birds, shorebirds, gulls, terns, and resident wildlife.

III. 1988 Water Conditions

Following a planned draw down of Owens Bay in 1987, the bay held only about 2 feet of water on 01/01/88.

The winter of 1987-88 was mild and open resulting in minimal runoff from snowpack.

Immediately after ice out the Owens Bay well was diverted directly to the bay and remained flowing there until the end of the year resulting in an approximate maximum water depth of 4 feet.

Total precipitation in 1988 was 25.46" which is slightly above the 21.37" average.

1988 Water Levels - Owens Bay

Date	Water Level
03/31	1439.50
05/10	1439.68
06/08	1439.92
07/01	1439.52
08/01	1439.34
08/31	1439.18
10/03	1439.56
11/04	1439.72

IV. Ecological Effects of the Past Years Levels on Owens Bay

The number of waterfowl pairs on Owens Bay in 1988 (173 pairs) was down by 30% from the 244 counted in 1987.

Owens Bay provided good brood habitat throughout most of the year although emergent escape cover was lacking.

V. 1989 Water Management Objectives

Water management activities for 1989 are to contain as much runoff as possible in Owens Bay. The artesian well will continue to run at full flow in order to offset annual evaporation.

The prairie ponds will be raised gradually during May and June.

Management plans were to introduce northern pike, yellow perch and largemouth bass into Owens Bay and use it as a stocking source for Lake Andes which was accomplished.

WATER UNIT: Broken Arrow Waterfowl Production Area

I. Introduction

The Broken Arrow WPA is a 2650 acre tract in Douglas and Charles Mix Counties, SD. Two drainage systems existed on the property when purchased. The Mud Lake Drain has an upstream watershed of 25,600 acres, while the second system, the Joubert Drain, has a 12,320 acre watershed. Five ditch plugs or low head dams, with concrete stop-log control structures, were installed in 1979 along the drainage ditches, two on the Mud Lake ditch and the remaining three on the Joubert drain. Dam #6 was constructed below dam #2 on the Mud Lake drain in 1984. Dam #7 on the Joubert Drain was constructed during the fall of 1986 in cooperation with Ducks Unlimited who funded the project design and construction. A water rights permit for the storage of 131.2 acre feet of water was granted by the South Dakota Department of Water and Natural Resources. The impoundment at capacity covers 56.4 surface acres. The development increased the quantity of pair habitat by creating 5.9 miles of shoreline. The maximum depth is 6.5 feet. Design specifications for the seven dams are as follows.

Embankment Volume YD3	High Water Contour	Surface Acres	Acre-feet Impounded
Dam #1 - 76	Unk	6.2	5.7
Dam #2 - 755	Unk	27.9	82.6
Dam #3 - 2761	Unk	43.6	163.0
Dam #4 - 586	Unk	34.7	88.3
Dam #5 - 137	Unk	6.3	5.2
Dam #6 - 900	Unk	30.0	Not determined
Dam #7 - 5470	1526.0	56.4	131.2
TOTAL		205.1	476.0

The capability to manipulate water levels is very limited on the Broken Arrow WPA. Impoundments can be drawn down as objectives dictate. However, to reflood depends on spring runoff and no capability to flood when desired is possible.

II. Objectives

The storage of annual runoff in impoundments is to be used primarily as waterfowl production habitat. The habitat provided also benefits marsh and water birds, shorebirds, gulls, terns, and raptorial birds. Secondary benefits are provided to resident wildlife and livestock used for management purposes. Water excess to storage needs is allowed to drain through the system.

III. 1988 Water Conditions

Spring runoff was extremely low even though moderate snowfall was recorded over most of the WMD (36.5 inches at Pickstown). Most moisture seemed to be soaked up by the soil. Dam #4 on the Joubert drain filled to capacity while dam #3 received little runoff and remained at 18 inches below the outlet. The DU impoundment which is the third dam in line to fill on the Joubert drain did not receive any runoff and was approximately 3.5 feet below outlet level.

A heatwave in June and July resulted in several days that exceeded 100o F. Water levels slowly dropped as below normal precipitation fell during that period.

Impoundments #2 and #6 were drawn down during the fall of 1987-88 to winterkill carp. The draw down was successful as numerous dead carp were found during early spring 1988. The impoundments did not fill to capacity during the spring runoff period.

Total precipitation for 1988 was 22.67 inches which is slightly above the normal of 21.37 inches.

IV. Ecological Effects of the Past Years Water Levels on the Broken Arrow WPA

Impoundments #2 and #6 had greater waterfowl use and higher water quality as a result of a lower carp population. Both submergent and emergent plant species increased.

Impoundments #3, #4, and #7 were drawn down in October to winterkill the carp populations. Pool #3 could not be completely drained, but should be shallow enough to winterkill.

V. 1989 Water Management Objectives

Water management objectives for 1989 are to contain as much spring runoff as possible in all pools. Carp populations and their effects on water quality will be monitored.

WATER UNIT: Karl E. Mundt National Wildlife Refuge

The Karl E. Mundt NWR borders the Missouri River in Gregory County. The refuge was established in 1974 to protect habitat important to wintering bald eagles. The only water on the unit itself are four small (less than 1 acre) stock ponds that are used in conjunction with the grazing program. There is also a free-flowing artesian well that provides water for a small 1/2 acre pond.

There presently is no active management of water on the Karl E. Mundt Refuge.